

Surface deformation due to the May 27, 1995 Sakhalin earthquake and related events measured by JERS-1 SAR interferometry*

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A large ($M_w=7.0$) earthquake on May 27, 1995 at 52.6° N, 142.8° W completely destroyed the town of Neftegorsk in the northern part of Sakhalin Island and caused more than 2000 human deaths. The shallow, right-lateral, strike-slip earthquake resulted in extensive surface ruptures and up to 7 m of horizontal displacement as reported by field workers. The southern part of the mainshock epicentral zone was imaged by the JERS-1 SAR (synthetic aperture radar) one month (April 28) before and two weeks after (June 11) the mainshock. Despite drastically changed surface conditions in the 44 days between the two images, due primarily to spring thaw, we obtained reasonably good interferometric correlation with the L-band (24 cm) SAR pair. The topographic component of the interferogram was removed by subtracting the phase signature of a digital elevation model, and the resulting difference interferogram records surface displacements ranging up to -1 meter in the radar look direction (-35 degrees west of the vertical) with a complex pattern. The interferogram records the distribution of deformation reflecting displacement during both the mainshock and after shocks. The mainshock fault trend is nearly parallel to the JERS-1 satellite track, and horizontal displacement in that direction has no component in the radar look direction nor expression in the interferogram. The large apparent 1 y near-vertical displacements on the interferogram probably reflect aftershocks with important dip-slip components or complexities in the rupture zone of the mainshock. The ability to map the deformation pattern can aid the assessment and mitigation of damage.

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